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Managing Spent Fuel and High-Level Radioactive Waste

Summary of presentation to the Blue Ribbon Commission on America's Nuclear Future
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Interim management: Today's U.S. commercial nuclear reactors will generate on the order of 100,000 metric tons of spent fuel containing about 1,000 metric tons of plutonium. So long as these reactors are operating, spent fuel pools are essential. Safety and security are best served if pool storage is in a low-density, open frame arrangement and as much of the spent fuel as possible is put into hardened dry storage. Suitable and sufficient storage is also essential for defense high-level waste.

Reprocessing spent fuel will multiply risks and costs without obviating the need for a repository. Even if the Commission believes the United States should pursue breeder reactors, it makes no sense to reprocess light water reactor spent fuel. It is impossible to use more than about one percent in a light water reactor system. France uses only about 0.7 percent of the underlying uranium resource, contrary to the mythology that France and Britain are using or could use 90 to 95 percent of the "energy value of spent fuel." The Commission should review actual data and disabuse the public of such a notion.

Using most of the uranium resource would require breeder reactors. The sodium-cooled fast breeder has not been commercialized despite $100 billion in worldwide expenses. Before recommending its further development, the Commission should carefully analyze the failure to establish a discernible learning curve. In any case, even with breeder reactors, reprocessing light water reactor fuel to recover the uranium is not reasonable. Most of the uranium resource is in depleted uranium, which is a waste today. The Commission should also evaluate whether breeder reactors could make a significant contribution to reducing carbon dioxide emissions prior to 2050, and the merits of public expenditures on them relative to RD&D on energy efficiency and renewable energy sources.

Long-term considerations: Direct disposal of spent fuel without reprocessing is by far the least risky approach to long-term management. A deep geologic isolation system consists of three elements – (i) the spent fuel and associated containers and other engineered barriers, (ii) the repository sealing system, and (iii) the geologic host rock. They must work together if future risks are to be minimized. A site selection process should await at least a decade of scientific research on various combinations of these three elements. This will allow a technically sound approach to site selection.

Radiation protection standards should be set independent of the site. The 1983 recommendation of the National Research Council of 10 millirem per year maximum peak individual dose is worthy of careful consideration by the Commission. Finally, it is essential to create an independent (non-DOE) institution with effective oversight, including from state, local, and tribal governments, for the development and implementation of the geologic isolation system. It is critical to guard against any approach that would put economic incentives to communities ahead of a scientifically and technically defensible process for site selection. Anything less is likely to result in environmental injustice. The past history of such efforts in the United States indicates that it is also likely to fail.